

PILOT PROJECT

for

ZERO DISCHARGE BASED WATERSHED MANAGEMENT

FINGESHWAR WATERSHED

OF

FOREST RANGE : FINGESHWAR

FOREST DIVISION : EAST RAIPUR

DISTRICT - RAIPUR,

CHHATTISGARH

TOTAL PROJECT AREA = 2400.00 Hect.

PROJECT COST: RS. 384.00 LACS

**Department of Forest
Govt. of Chhattisgarh**

PROPOSED COMPONENTS OF THE FINGESHWAR WATER SHED MANAGEMENT PROJECT

- 1. Proposed area to be treated :- 2400.00 ha.**
- 2. Proposed Cost/Norms :- Rs. 16000/- ha.**
- 3. Total Project Cost :- 384.00 lakhs**

3. Proposed breakup of cost :-

| | | |
|-------|---|-------------|
| (i) | Administrative Cost | 4.5% |
| (ii) | Works Component | 15% |
| (iii) | Livelihood Component through Agriculture Development. | 29% |
| (iv) | Development of water harvesting system | 20% |
| (v) | Afforestation/Pasture development activities. | 24.5% |
| (vi) | Technology-Transfer etc. | 2% |
| (vii) | Promotion of micro-enterprises and skill development | 5% |
| | | 100% |

**DIVISIONAL FOREST OFFICER
EAST RAIPUR DIVISION, RAIPUR**

Project Outlay:- The Project out-lay is created for 3 years which is given below.

PROPOSED COMPONENTS OF THE FINGESWAR
WATER SHED MANAGEMENT PROJECT
DETAIL EXPENSES WORK WISE

1st YEAR (UNDER JICA)
2009-10

| S. no. | Detail of Works | Area (in ha.) | Rate Per ha. | | Amount (in lakh) |
|--------------|---|---------------|---------------|-------------|------------------|
| | | | in Percent | in Rupees | |
| 1 | Administrative Cost including Survey of Area to be Treated; Formation of SHG's, Project Formulation, E.PA. | 2400 | 4.50% | 400 | 17.28 |
| 2 | Work Components :- Soil & Moisture Conservation works. Civil Structure :- (i) Contour trenches. a. Contour bunds b. Nala bunds. c. Checkdams. d. Gabbion Structures etc. | 2400 | 15% | 2400 | 57.60 |
| 3 | Afforestation/Pasture Development Activities:- Nursery Preparation for Fuel & Fodder Species. | 2400 | 02% | 320 | 7.68 |
| 4 | Promotion of Micro Enterprises and Skill Development Through :- (i) Farm-Forestry. (ii) Bio-Gas. (iii) Vegetable Production (Horticulture Department) (iv) Vermi-Compost. (v) Coal-Briquettes. (vi) Artisan. | 2400 | 05% | 800 | 19.20 |
| 5 | Technology Transfer (Training Among Farmers, Land User Groups & other Forest Dwellers) | 2400 | 02% | 320 | 7.68 |
| Total | | 2400 | 28.50% | 4240 | 109.44 |

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PROPOSED COMPONENTS OF THE FINGESWAR
WATER SHED MANAGEMENT PROJECT
DETAIL EXPENSES WORK WISE

1st YEAR (UNDER NREGA)
2009-10

| S. no. | Detail of Works | Area (in ha.) | Rate Per ha. | | Amount (in lakh) |
|--------------|---|---------------|--------------|-------------|------------------|
| | | | in Percent | in Rupees | |
| 1 | Development of Water Harvesting systems :- | 2400 | 20% | 3200 | 76.80 |
| | (i) Construction of Small Percolation Tanks (Dabries) | | | | |
| | (ii) Construction of Big Percolation Tanks (Talab) | | | | |
| Total | | 2400 | 20% | 3200 | 76.80 |

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EAST RAIPUR FOREST DIVISION

PROPOSED COMPONENTS OF THE FINGESWAR
WATER SHED MANAGEMENT PROJECT
DETAIL EXPENSES WORK WISE

2nd YEAR (UNDER JICA)
2010-11

| S. no. | Detail of Works | Area (in ha.) | Rate Per ha. | | Amount (in lakh) |
|--------------|--|---------------|--------------|-------------|------------------|
| | | | in percent | in Rupees | |
| 1 | Livelihood Component through Agriculture Development & Animal Husbandry activities:- (i) Paddy Cultivation (ii) Vegetable Production. (iii) Organic Cultivation & Production of Endangered (Species of agriculture importance) (iv) Harvesters. (v) Tractors. (vi) Improved Variety of seeds. (vii) Bore-Wells (Loan/ Subsidy payment) | 2400 | 16% | 2560 | 61.44 |
| 2 | Afforestation/Pasture Development Activities:- Site Preparation for Plantation of Fuel & Fodder Species (About 200 Hact.) | 2400 | 05% | 800 | 19.20 |
| Total | | 2400 | 21% | 3360 | 80.64 |

DIVISIONAL FOREST OFFICER
EAST RAIPUR FOREST DIVISION

PROPOSED COMPONENTS OF THE FINGESWAR
WATER SHED MANAGEMENT PROJECT
DETAIL EXPENSES WORK WISE

2nd YEAR (UNDER NREGA KISSAN SAMRIDHI YOJANA)
2010-11

| S. no. | Detail of Works | Area (in ha.) | Rate Per ha. | | Amount (in lakh) |
|--------------|--|---------------|--------------|-------------|------------------|
| | | | in percent | in Rupees | |
| 1 | Livelihood Component :- (i) Tube-Well Facility. ¼Kishan Samriddhi Yojna½ (ii) Lift-Irrigation. (iii) Irrigation Canal. (iv) Wells. | 2400 | 13% | 2080 | 49.92 |
| 2 | Afforestation/Pasture Development Activities :- (i) Plantation of Indigenous Grasses. (ii) Vegetative barriers. | 2400 | 15% | 2400 | 57.60 |
| Total | | 2400 | 28% | 4480 | 107.52 |

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PROPOSED COMPONENTS OF THE FINGESWAR
WATER SHED MANAGEMENT PROJECT
DETAIL EXPENSES WORK WISE

3rd YEAR (UNDER JICA)
2011-12

| S. no. | Detail of Works | Area (in ha.) | Rate Per ha. | | Amount (in lakh) |
|--------------|---|---------------|--------------|------------|------------------|
| | | | in percent | in Rupees | |
| 1 | Afforestation/Pasture Development Activities:- Plantation of Fuel & Fodder Species (About 200 Hact.) Tall Tree and Indigenous Grass Planting. | 2400 | 2.5% | 400 | 9.60 |
| Total | | 2400 | 2.50% | 400 | 9.60 |

DIVISIONAL FOREST OFFICER
EAST RAIPUR FOREST DIVISION

**PRAPOSED AREA FOR WATERSHED MANAGEMENT
TREATMENT OF FINGESHWAR RANGE**

East Raipur Division, Raipur

| S.No. | Compartment No. | Total Area (In Hact.) | Watershed Area (In Hact.) | MICODE |
|---------------------------|------------------------|------------------------------|----------------------------------|---------------|
| 1 | 2 | 3 | 4 | 5 |
| 1 | 17 | 292.800 | 106.005 | 4G2F5A3a |
| 2 | 18 | 163.920 | 122.834 | 4G2F5A3a |
| 3 | 19 | 30.180 | 20.114 | 4G2F5A3a |
| 4 | 20 | 49.970 | 49.967 | 4G2F5A3a |
| 5 | 21 | 68.680 | 68.680 | 4G2F5A3a |
| 6 | 22 | 46.900 | 1.060 | 4G2F5A3a |
| 7 | 23 | 310.830 | 188.290 | 4G2F5A3a |
| 8 | 24 | 266.750 | 3.964 | 4G2F5A3a |
| 9 | 35 | 353.660 | 353.617 | 4G2F5A3a |
| 10 | 30 | 148.870 | 31.693 | 4G2F5A3b |
| 11 | 31 | 54.850 | 22.232 | 4G2F5A3b |
| 12 | 32 | 204.400 | 60.995 | 4G2F5A3b |
| 13 | 34 | 146.370 | 146.343 | 4G2F5A3b |
| 14 | 36 | 219.980 | 220.042 | 4G2F5A3b |
| 15 | 42 | 296.230 | 124.856 | 4G2F5A3b |
| 16 | 43 | 283.830 | 144.997 | 4G2F5A3b |
| 17 | 37 | 102.620 | 101.651 | 4G2F5A3c |
| 18 | 38 | 264.890 | 133.630 | 4G2F5A3c |
| 19 | 39 | 322.750 | 138.980 | 4G2F5A3d |
| 20 | 40 | 267.630 | 7.92705 | 4G2F5A3d |
| 21 | 56 | 265.600 | 111.947 | 4G2F5A3e |
| 22 | 58 | 204.690 | 59.570 | 4G2F5A3e |
| 23 | 59 | 269.980 | 183.923 | 4G2F5A3e |
| 24 | 60 | 15.400 | 15.395 | 4G2F5A3e |
| Total:- | | 4651.780 | 2418.712 | |
| Revenue Area | | 416.326 | 4G2F5A3a | E/Raipur |
| Revenue Area | | 498.919 | 4G2F5A3b | E/Raipur |
| Revenue Area | | 265.74 | 4G2F5A3e | E/Raipur |
| Revenue Area | | 455.785 | 4G2F5A3d | E/Raipur |
| Revenue Area | | 359.523 | 4G2F5A3c | E/Raipur |
| Total Revenue Area | | 1996.293 | | |

MICRO WATERSHED WISE FOREST & REVENUE AREA

| micro watershed code | Total Forest Area | Total Revenue Area |
|-----------------------------|--------------------------|---------------------------|
| 4G2F5A3a | 914.531 | 416.326 |
| 4G2F5A3b | 751.158 | 498.919 |
| 4G2F5A3c | 235.281 | 359.523 |
| 4G2F5A3d | 146.907 | 455.785 |
| 4G2F5A3e | 370.835 | 265.74 |
| Total | 2418.712 | 1996.293 |

INDEX

| S.N. | PARTICULAR | PAGE NO. |
|-------------|-------------------|-----------------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |

INTRODUCTION:-

The water shed area belongs to Deosara hills confined to Fingeshwar Range of East Raipur Forest Division. Indian water shed classification figure it in 4GF5A3 and its various miliwater shed like A3a to A3e. It compares forest as well as revenue area of 8 villages, which are rainfed and each of irrigation potential. The entire area constitutes the catchment of Sukha Nala. It is a dry nala connected with small rainfed streams, pours water in to it only during rainy days. No perennial source of water is available in the watershed area however Sukha Nala with a 50' depth in sand bed runs subsurface during summer. The area which constitutes forest part is about 2418.772 Hectare while revenue area and agriculture field constitutes to an extent of 1996.293 Hectare. Forest area is exclusively confined on the left bank of Sukha Nala along with villages on the foothills. We can have a clear look of Recharge and Discharge zone. Entire area is well connected with fair weather roads and accessible throughout the year. Under the water shed treatment concept it was realised that surface run off has to channelised so as to utilise the utmost rainfall potential in the proposed area besides recharging ground water and retaining soil moisture to enhance the vegetative growth. Primarily the inherent irrigation network is in the mindset of villagers to catch the excessive surface run-off and to divert it in to their local ponds. Our strategy would line up the very basic local technique of water harvesting and channelising is in to Big ponds, Diversion canal and small Dabarries for individual field also.

Aims & Objectives of Artificial Recharge and Rain Water Harvesting

The main objectives and aims of the present study is to construct artificial recharge structures and do the rain water harvesting in the hilly/forested part of Fingeshwar area in which, most of the rain water goes as surface runoff and to have benefits to the users or population residing in downstream areas. The artificial recharge and rainwater harvesting techniques helps in augmenting the groundwater storage and surface storages in the following ways:

1. Enhances the sustainable yield wherever aquifers have depleted due to over exploitation.
2. Conserves the rain water wherever it is received.
3. Conserves and stores the excess run off water going waste for meeting out the future requirements of the users.
4. Improves the quality of groundwater.
5. Keep the soil moisture content intact so that topsoil vegetation is protected.
6. Give the employments to rural youths.

Status of Water shed :-

The proposed watershed has an area of 2418.724 Hectare spread in 24 forest compartments. As per forestry point of view the recharge zone consist of almost medium to poor and degraded forest resource. It is under heavy biotic pressure resulting in lack of soil moisture, sparse regeneration and deficient in fodder species and grasses. It is on the verges of almost heavy soil erosion and less water retention characteristic.

Socio Economic Status :-

The classified watershed area under this proposal affects the social life of almost 8 villages namely Bamhani, Deosara, Karchali, Dwartara, Khudsa, Nagjhar, Bhunjiapara (Sorid khurd), and Sarkada. In general some are big villages having population more than 1000 while most of the villages area medium to small having population ranging from 400 to 500. The general well being of the villagers depends on the agriculture practice and their principle crop production of paddy during mansoon. The productivity of their fields are medium to low which does not touches to an average rice production of chhattisgarh. Single cropping system is in practice and only paddy is their choice. Some irrigated medium to big farmer use to grow summer paddy which is considered to

be the cash crop like items for agriculturist. It is observed that is almost all the villages marginal to small farmers constitutes the major part of the society. However some big farmer having 20-25 Acres of agriculture land with modern equipment like tractors etc. leads in agricultural production but cannot utilized their entire filed in summer. It was observed that cash crop is not in practice for any type of farmers Rearing of cattle is a traditional system of having more number of cow heads but of no milk. The cattle population is underutilized and does not contributes to any extent in their economy. Villagers are in general depends entirely on forest for their demand of Fuel & Fodder. Hecking of Karra trees are very common in adjoining forest compartment. Collection of MFP is Significant due to alternate source of livelihood specially for landless and labor class however seasonal migration for jobs has been differed due to NREGA. The villagers have shown their commitment to raise plantation on their field for their Nistar purposes. They are aware of the degradetion in productive capacity of their adjoining forest area and hence they have their commitment to take up the watershed area treatment up to grass root level. Education level is normal as seen in the villages however schools are available up to middle level. It is also observed that in most of the villages ST Population is dominant specially Nagjhar (Sorid), Bhunjiapara, (Sorid Khurd), Deosara, Bamhani Dewartara etc. however entire village community solely depends upon paddy cultivation. per capita income for small farmer are sustainable to the national level although marginal former and landless belongs to B.P.L. depends on govt. scheme of Rs. 2/- per Kg. of Rice which is staple diet of the entire watershed area.

Biodiversity :-

The area is biodiverse and rich in floral potential. The forest cover consist of most of the timber, fuels and fodder species besides a ground floara of medicinal plants and agriculture crops of different variety like coarsegrains and paddy occupies its place in agriculture field. However some scented paddy crops

are on the dawn of extinction. Cattle population have its diverse variety of cow, buffallow and goats. The forest type is southern Tropical Dry Deciduous mainly mix classified as "5A/d Southern Tropical Dry Deciduous" principal species identified in watershed area are Saja, Dhawada, Haldu, Bel, Aonla, Garari etc.

Irrigation System:-

Well defined irrigation system has not been established in all 8 villages. These villages are situated at the tale of the canal which would never recharge these area. Some big talab/ tanks have been created to provide last water scarcity for paddy during month of September - October otherwise some big farmers have created borewells and pump. Water table can play a vital role for the entire watershed because of high water table about 100 to 150'. However this potential is not common among villages. As per repots in PRA out of 1227.170 hectare of agriculture land use pattern only 335.353 of land is categorised as irrigated otherwise all the area is rainfed only.

Demographic Status:-

The villages situated in the command area of the watershed has following demographic characteristic given in table – 1 to 5.

Table-1

Statement of irrigated/unirrigated agriculture land

| S.No. | Name of The Village | Toral Revenue Area (In Ha.) | Total Agriculture Land (In Ha.) | Total Irrigated Land (In Ha.) | Total Unirrigated Land (In Ha.) | Type of Irrigation System |
|----------------|-------------------------------|------------------------------------|--|--------------------------------------|--|--|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Bamhni | 247.390 | 181.200 | 45.300 | 135.900 | Bore well |
| 2 | Devsara | 259.770 | 165.610 | 3.643 | 161.967 | Bore well & Tank |
| 3 | Karchali | 111.870 | 93.580 | 34.400 | 77.470 | Bore well |
| 4 | Dawartara | 242.960 | 177.240 | 14.179 | 163.061 | Bore well, Tank, Stop Dam & Lift-Irrigation. |
| 5 | Khudsa | 368.580 | 132.000 | 10.000 | 122.000 | Bore well & Stop Dam |
| 6 | Nagjhar | 240.700 | 62.040 | 9.306 | 52.734 | Bore well & Tank |
| 7 | Bhunjiyapara (Sorid Khurd) | 544.610 | 273.160 | 113.525 | 159.635 | Bore well & Tank |
| 8 | Sarkada | 273.410 | 142.340 | 105.000 | 37.340 | Canal |
| Total:- | | 2289.290 | 1227.170 | 335.353 | 910.107 | |

Table-2**Status of Village Wise Literacy**

| S. No. | Name of The Village | Total Population | No. of Male | Literacy of Male | No. of Female | Literacy of Female | Litracy % of Male | Litracy % of Female |
|----------------|-------------------------------|-------------------------|--------------------|-------------------------|----------------------|---------------------------|--------------------------|----------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | Bamhni | 788 | 399 | 218 | 389 | 203 | 58.80 | 50.12 |
| 2 | Dawartara | 525 | 237 | 145 | 288 | 138 | 61.18 | 48.00 |
| 3 | Devsara | 496 | 250 | 180 | 246 | 176 | 62.92 | 59.82 |
| 4 | Karchali | 504 | 227 | 185 | 277 | 115 | 81.49 | 41.51 |
| 5 | Khudsa | 710 | 360 | 290 | 350 | 230 | 80.55 | 65.71 |
| 6 | Nagjhar | 195 | 95 | 55 | 100 | 46 | 61.18 | 46.00 |
| 7 | Bhunjiyapara (Sorid Khurd) | 2339 | 696 | 453 | 643 | 366 | 65.00 | 47.00 |
| 8 | Sarkada | 588 | 289 | 196 | 299 | 180 | 67.82 | 60.20 |
| Total:- | | 6145 | 2553 | 1722 | 2592 | 1454 | | |

Table-3
Status of Village Wise Farmer's

| S. No. | Name of The Village | Total Family | Small | Medium | Big | Landless |
|----------------|----------------------------------|---------------------|--------------|---------------|------------|-----------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Bamhni | 118 | 40 | 55 | 23 | - |
| 2 | Dawartara | 136 | 36 | 78 | 22 | - |
| 3 | Devsara | 101 | 18 | 48 | 34 | - |
| 4 | Karchali | 73 | 55 | 8 | 73 | 05 |
| 5 | Khudsa | 133 | 29 | 71 | 33 | 09 |
| 6 | Nagjhar | 17 | 05 | 10 | 02 | 05 |
| 7 | Bhunjiyapara (Sorid Khurd) | 325 | 50 | 100 | 175 | 75 |
| 8 | Sarkada | 112 | 21 | 71 | 20 | 08 |
| Total:- | | 1015 | 254 | 441 | 382 | 102 |

Table-4
Status of Village Wise live stock

| S. No. | Name of The Village | Total Animal's | Cow | Buffalo | Goat | Bail |
|----------------|-------------------------------|-----------------------|------------|----------------|-------------|-------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Bamhni | 514 | 160 | 40 | 90 | 224 |
| 2 | Dawartara | 450 | 100 | 50 | 150 | 150 |
| 3 | Devsara | 415 | 150 | 100 | - | 165 |
| 4 | Karchali | 265 | 130 | 35 | - | 100 |
| 5 | Khudsa | 100 | 50 | 25 | - | 25 |
| 6 | Nagjhar | 160 | 30 | 20 | 50 | 60 |
| 7 | Bhunjiyapara (Sorid Khurd) | 489 | 306 | 74 | 100 | 285 |
| 8 | Sarkada | 100 | 50 | 25 | - | 25 |
| Total:- | | 2493 | 976 | 369 | 390 | 1034 |

Table-5
Village-wise Demographic Statement

| S. No. | Name of The Village | Total Population | Male Population | Female Population | Total ST Population | Male ST Population | Female ST Population | Total SC Population | Male SC Population | Female SC Population | Total OBC Population | Male OBC Population | Female OBC Population | Total General Population | Male General Population | Female General Population |
|----------------|-------------------------------|------------------|-----------------|-------------------|---------------------|--------------------|----------------------|---------------------|--------------------|----------------------|----------------------|---------------------|-----------------------|--------------------------|-------------------------|---------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 1 | Bamhni | 788 | 401 | 387 | 394 | 199 | 195 | 24 | 13 | 11 | 366 | 186 | 180 | 04 | 03 | 01 |
| 2 | Dawartara | 525 | 237 | 288 | 326 | 155 | 171 | 94 | 34 | 60 | 105 | 48 | 57 | - | - | - |
| 3 | Devsara | 496 | 250 | 246 | 375 | 189 | 186 | 13 | 7 | 6 | 108 | 54 | 54 | - | - | - |
| 4 | Karchali | 504 | 227 | 277 | 97 | 38 | 59 | 25 | 10 | 15 | 381 | 178 | 203 | 01 | 01 | - |
| 5 | Khudsa | 710 | 360 | 350 | 4 | 2 | 2 | 176 | 90 | 86 | 530 | 268 | 262 | - | - | - |
| 6 | Nagjhar | 195 | 95 | 100 | 195 | 95 | 100 | - | - | - | - | - | - | - | - | - |
| 7 | Bhunjiyapara (Sorid Khurd) | 1339 | 696 | 643 | 320 | 170 | 150 | 45 | 25 | 20 | 971 | 501 | 470 | 03 | - | 03 |
| 8 | Sarkada | 588 | 289 | 299 | 122 | 62 | 60 | 10 | 5 | 5 | 456 | 226 | 230 | 03 | 02 | 01 |
| Total:- | | 5145 | 2555 | 2590 | 1833 | 910 | 923 | 387 | 184 | 203 | 2917 | 1461 | 1456 | 11 | 06 | 05 |

Physiographic characters of the watershed :-

Generally the catchment area is hill and valley type of configuration. Its highest point has a height of 240 mt. at m.s.l. while sharp decline in the hill leads to a gentle sloping 10^0 to 15^0 slope near the villages.

Climate :-

Normal climate condition prevailing in the water shed area is dry type and lack of moisture content. Area is rainfed and rainfall is dominated by South West monsoon starts after 15 June onward to the end of September. Maximum rainfall recorded up to 1210 mm and minimum 815 mm in last years. No. of average rainy days are near about 60 and spread over 4 month.

Temperature :-

The mean annual temperature fluctuates from 48^0C maximum to 13.5^0C minimum. In the month of May absolute dry condition exhaust all moisture in the area and water table also goes down. December is the coldest month and leaf fall in the entire watershed area takes place.

Geology Rock & Soil:-

The water shed area is characterised by the formation of shales in Precambrian and Archaean type of rock formation. It consist of sedimentary rocks of Bundeli Granite, Gneiss of Chanderpur group of rocks.

Soil:-

Generally sandy loam soil type prevails in the watershed area. It comprises excessive sand with quartzite and susceptible for soil erosion. Some time lateritic soil also occurs with heavy grains of quartzite, Commonly loamy soil type with trace of sand is found in the agriculture field in revenue area. Soil is lack of moisture content.

Soil Moisture Regime :-

The water shed area have lack of soil moisture. During rainy season surface runoff is excessive due to configuration of the area and sandy base of the soil. Water generally percolate down to aquifer but recedes to Sukha Nala. Normally the vegetation is also of dry type like Karra, Bhirra and Harra thrives well in low moisture content in the soil and such forest covers almost 80% of the entire vegetation.

Water Regime :-

The entire water shed area is rainfed. All the streams and nallah are alive only up to October- November otherwise gets dry as the monsoon ceases. It is also characterised by subsurface run-off within the sandbed of all nallas specially Sukha Nallah. Soil moisture content reduces to almost zero level in May-June and only small ponds having loamy soil in their beds possess some water. A small patches of stagnant water can be seen in some pockets of local nallah near by the foot hills. In watershed area two dams retains a trace of water in the pinch period of summer although water table remains stable in tubewells and hand pump and utilized for irrigation purpose in summer paddy crop.

uD'kk yxkuk gS

The forest:-

As per Champion & Seth Classification watershed area is classified as 5A/d Southern Tropical Dry Deciduous forest mainly Mix type. The general aspect of all the compartment on the left bank of Sukha Nala are North Eastern facing with sharp decline in slope from 10° to 20° gentle slope near foot hill. The configuration is almost plateau on the upper reaches of ridge. The flat plateaus are characterised by the site quality III to IV type forest in the patches and some open area with rock and soil combination. The downs of the hill consist of good forest cover of almost 0.5 density, however foot hill, have good soil depth and suitable for natural regeneration. Basically Bhirra (*Chloroxylon swetenia*) find its position on the hill while rolling slopes and foot hill considered to be the regime of Karra (*Clystanthus collinus*) & Saja (*Terminalia tomentosa*). On either side of Sukha Nala general aspect of the compartment faces toward south Westerly direction. Following are the different canopy in the forest area. (Entire area is devoid by Bamboo).

uD'kk yxkuk gS

Top Canopy:- Saja, Dhawada, Tinsa, Salai, Lendiya, Tendu, Bhirra (Chloroxylon swetenia) Mahua, Kusum, Bija & Kullu, Bel (Aegle Marmelose)

Middle Story:- Karra, Aonla, Achar, Papada, Dudhi (Karra dominates the entire middle story) & Bel.

Ground Floara:- Harsingar , Woodfordia, Gudsukhadi, Marorphalli, Menhar,

Climbers:- Chilati, Smilax Microphylla, Butea superba (Palasbel)

Floara of medicinal importance :-

The forest cover in the watershed area has been identified with some important biodiversity related to medicinal importance. Among them Satavar, Kalmegh, Gudsukhadi, Baichandi, Safed musali, Kalimusali, Bhringraj, Feng, Bhookumhara, Smilax etc. are in abundance during rainy season.

Biotic pressure:-

Nistar of entire watershed area depends on these forest compartment for need of human being as well as cattle population. Fuel wood, fodder and MFP collection in the forest area leads to a degradation of productivity of forest Hacking of Karra & Bhirra often seen on the foot hill area. Incidents of fire are often seen from April to May due to collection of Mahua, which is preferred MFP for almost

all category of residents. Due to excessive human interference in the forest crop, soil erosion becomes a common feature of this area.

Wind blow:-

Normally south westerly wind blow during monsoon period creates disturbance in the watershed area. The most common phenomena is uprooting of trees in the direction of wind. In dry season it also enhance the soil degradation.

Identification of the Problems: -

During PRA exercise of almost all 8 villages the most common problem emerges as the revival of irrigation potential of entire watershed area. It has the potential but surface run-off is so high that it could not be controlled by ordinary means of making. Some ponds or Dabaries. Mainly the mutual coexistence of forest & forest dwellers has been vanished and increasing biotic pressures has reduced the water retention capacity of the watershed area. Some problems are discussed as-

Degradation of forest – The watershed area consist of good quality of miscellaneous forest which can be a sustainable mechanism for forest dweller but excessive extraction of fuel wood has suppressed the crop to a degraded type of forest cover. All the species of coppicing nature gets survive after cutting stumps but less coppicer are on the verge of extinction. Excessive grazing and head loaders carried out a situation of demand & supply gape Degradation in forest cover has directly resulted in increased run-off and lack of water percolation. Earlier the streams & nalla were alive during February-March are now dry during November-December.

Agriculture Production: –

Per capita crop production is very low in terms of average crop production of the state. It is 10-12 quintal / acre of paddy in monsoon however only one crop is raised in the entire watershed area. Crop or rotation of multiple cropping system is not adopted due to lack of irrigation command. It is only a rainfed based ecology of the entire area. Although some big farmers with tube wells are capable of raising paddy in summer season also.

Alternate Livelihood :-

The entire population in the command area thrives only on the agriculture practices. Landless engage themselves in agriculture work available only for 4 months otherwise they could not manage to remain their village and migrate for their bonafide requirement of alternate livelihood available in peripheral area where irrigation system is well established.

Unproductive cattle population :-

A huge cattle population is a big problem for villagers more heads of cow and no milk production is a common feature of the entire area. It also creates heavy grazing pressure over forest cover.

Lack of Rural small scale Entrepreneurship:-

Although forest cover has potential of N.T.F.P. but rural based processing enterprises are not established. Only Tendu leaves collection takes place during 15–days of summer.

Endangered Species :-

Some species of high yielding paddy variety are vanished from their agriculture curriculum. The area has potential for production of coarse grains which demands less irrigation. However due to imbalance in ecology of entire area, some species of forest based are also on the verge of extinction and categorised an endangered for the local area.

Scarcity in Livelihood based income generating scheme:-

No such activities are functional in the entire watershed area. There may be possibility of alternate livelihood apart from traditional agriculture based economy, like Pisciculture, bee keeping vermicomposting N.T.F.P. based processing units etc.

Revival of Sukha Nala :-

It is one of the most severe problem of entire valley, which touches almost all villages of entire watershed area. Most of the stream, Nalla or any other water bodies drain out to this Sukha Nala. However it has surface run-off only for 15 days in mansoon otherwise it remains dry at surface level. In discussion with villagers it was found that sub surface runoff is available after 50' depth of the sand bed of nallah which has no use for the local villagers. The nallah have a big catchment of about 200 sq.km. of forest cover but its potential has not been identified.

Ecological Imbalance :-

The forest dwellers in watershed area has realised the depletion of water table, degradation of productive capacity of their agriculture field, lack of nistar

facilities and a general well being of population. Its a direct effect of ecological imbalance. The samities are now protecting their allotted area in some patches however the scene regarding forest protection is not impressive. Entire area is rainfed so the differed rainfall has also created a situation of flood and drought simultaneously in the watershed. Its a threat to ecology of the entire area.

Methodology for Solutions of Problems in Watershed Area:-

The total population of the watershed area is almost 6145 and the land available for the population is limited. It has no alternate to increase the production area beyond its capacity. These villages are situated on the fringe of forest but command area of any dam nearby is not possible to feed with canal. They are the tail end area for dam. Hence our methodology would be to adopt small but potential holding irrigation net work to catch the runoff in recharge zone and to retain it in as many as small and big water bodies as possible thus to increase soil moisture condition in agriculture field. At least one crop in the season should have its full production capacity. Recharge zone if permits the aquifer in next phase use of dugwells, borewells etc are also to be the alternate means of raising irrigation potential.

Interventions in Irrigation:-

Almost entire watershed area from ridge line to valley must be treated with full capacity in increasing recharging potential of forest cover, taking into consideration of geographical configuration of recharge zone which is a hill range along the villages must be treated with moisture & water interception structures like contour bunding or graded bundings, Contour trench, check dams, brush wood structure, gabion structure in the area of 45^o to 10^o of the slope of the aspect.

However big water storage tank and percolation tanks are required at foot hills in revenue area. It is the method of zero discharge based treatment of the catchments in which all the miliwatersheds of particular village would drain out to a common point or all drains would be interlinked so that all the excessive run off is diverted to a common point. This run off would be channellised into series of big tanks through common diversion or stop damn, so that during the heavy rain fall entire precipitation is stored. Then small ponds/dabarries are to be dug out in 5% area of individual agriculture field to make available for excesive run off and to increase soil moisture condition in their agriculture field. This method of irrigation networking would be low cost and needs some local irrigation experts with the local mid set of user groups.

To analyse the water retainion capacity and condition of equifer on the coming year, dug wells and bore wells would likely to be other tools for irrigation in small users groups among SHG.

Intervention in Enhancing the Agriculture production :-

while discussing the demographic situation of the villagers it was observed that entire population is classified into four categories of forest dwellers or farmers.

- (1) Big farmer holding capacity of above 10 Acres.
- (2) Small farmer upto 5 to 10 Acres of land.
- (3) Marginal farmers upto 1 to 5 Acres of land.
- (4) Land less having no agriculture field.

Our intervention is basically for first 3 category of the land holder.

Strategy for Marginal Farmers :-

The marginal farmers which contributes major population of the watershed are the concern of this project. These are the farmer having small land holding of 1

acre to 2 acre of land and due to single cropping system they are in the B.P.L. categories having sufficient land holding. The groups would be treated as SHG and all the agriculture field would be bunded, if leveling is required it would be preferred and almost 5% of the area would be provided with small pond in group, so that immediate irrigation alternate is available for productivity enhancement. If possible crop rotation with cash crop may be one of the best alternate for marginal farmers, providing improved variety of high yielding seeds, improved agriculture practice through mechanical method in SHG would be effective intervention at grass root level.

Small Farmers:-

Some what creative farmers are identified in this category, Almost 254 families in watershed belongs to small group. The run off which is available in excessive must be retrained in 5% of agriculture field of this category of farmers. Crop rotation and introducing cash crop and individual small mechanical agriculture implements are to be preferred. Raising early variety of paddy and vegetable production would be preferred. Some dug wells and individual tube well if possible would also to be looked for, vermi composting unit for some organic cultivation is also a remedy for agriculture production.

Big Farmers :-

Big Farmers are holding almost 15 acres of land and they are generally based on mechanical farming besides self irrigation system of bore wells etc. Our intervention would be to promote them for digging small water ponds in about 5% of the area with crop rotation like Soyabean, Arhar, Pea etc and vegetable production in place of summer paddy. They must be promoted for pure organic

cultivation with vermi composting and farm forestry would be introduced with high yielding medicinal cash crop like Turmeric, Zinzer, Aloevera, Aswagandha etc.

Raising plantation in bunds would also be preferred to meet the demand of nistar.

Intervention in Increasing Vegetative Cover :-

Entire watershed area has good potential of high productive forest but due to heavy biotic interference it is on the verge of almost degradation of valuable species and general stratification. Our intervention in this regard would be to rejuvenate the entire forest cover from 0.4 density to 0.8 density forest cover. The strategy is to regenerate the entire area while complete protection from grazing, head loaders, and fire hazards. We would also increase the soil moisture retention by creating soil moisture conservation structure. The Samities in these forest area would be given to the task of complete protection besides new area of degraded forest would be in convergence with raising fuel & fodder plantation & open area must be preferred with other NTFP based plantation activities. Grasses and shrubs would also to be planted in Contour trench and along nallah beds where soil is deposited. Thus a complete three storied forest cover creation would be the intervention for watershed area. Farm Forestry would also be linked directly with the villagers for their bonafide uses concept of fodder bank and rotational grazing in fodder plantation area would also be our target in achieving the gape of demand and supply of forest dwellers.

Intervention in Alternate Employment :-

The catchments area is entirely agriculture based so employment is generated only in agriculture sector, which does not sustains to entire rural labor

population of the watershed. Our intervention would be to provide alternate employment for those who have no land. Pisciculture Beekeeping, Bamboo handicrafts man ship. Production of vegetable through horticulture scheme etc among SHG. would be the alternate employment for the labor class besides NREGA work in the project area.

Unproductive Cattle Population :-

Our intervention is to reduce the unproductive cattle population by introducing mechanical or semimechanised agriculture practices providing mini tractors. Milch cattle rearing, instead of bearing load of so many cow heads and stall feeding to the cattle would be preferred. We are in a concept of complete fodder bank and introducing silage making unit to increase the dairy farming among villagers.

Livelihood through Small Entrepreneurship and income generating Scheme :-

Besides agriculture activities other alternate income generating schemes may be introduced to strengthen the natural resource based economy in rural sector. Water shed area has good variety of N.T.F.P. which is to be taken into consideration for processing units like Char, Chironji, Mahua processing, Triphala powder making units and Honey Beekeeping and packaging Pisciculture would be our prime activity which have ample potential once big tanks and ponds are available. Vermicomposting would also have its potential due to availability of organic matter. Complete organic cultivation in the small users group and medicinal cash crop would also be considered as livelihood activities in water shed area.

Intervention in Reviving Sukha Nala :-

Sukha Nala/Nadi is a big asset for the entire watershed area. Its physiographic location may benefit entire population of the water shed but any interest in this regard has not been shown. Its catchments is almost 200 sq. km. Any dam like structure could have emerged to improve irrigation facilities but its bed is about 50' filled with sand and only sub surface run off is available Our intervention would be to enhance this potential by creating dykes of impervious layers across the sand beds at certain places near by the villages so that the sub surface run off oozes out to surface and available for agriculture practices. Bore wells dug out in the sand bed is being practiced in Sorid khund village of water shed and farmer are getting summer paddy crop all along Sukha nala.

Intervention at Village Level :-

Watershed management project emphasis on the value based economic and ecological betterment for the population living in command area but our intervention would be the "Zero Discharge Based watershed Management" & complete mechanical treatment of ridge to valley and revenue area with 100% water retention capacity would definitely improve the local irrigation practices. However dug wells and bore well if required would also be used as alternate resources.

Convergence With Various Govt. Scheme :-

Complete mechanical treatment of entire water shed area would require a huge fund however it is possible for the govt to provide entire funds from one funding agency but our strategy is to incorporate all line departments for the watershed area. Our discharge zone would be supported by funds available for NREGA and BRGF besides Tribal welfare Department also.

Participation of N.G.O. :-

To intervene in the grass root level of forest dwellers and farmer community an N.G.O. is required. Entire project would be suggested and supported by an N.G.O. called Gramin Vikash Trust. we have a tie-up with Gramin Vikash Trust and they are exercising P.R.A. etc and suggesting methodology for different aspect of irrigation network and ecological balance.

CONCLUSIONS AND RECOMMENDATIONS

A) Conclusions:

The main objectives and aims of the present study is to construct artificial recharge structures and do the rain water harvesting in the hilly/forested part of Fingeshwar area in which, most of the rain water goes as surface runoff and to have benefits to the users or population residing in downstream areas.

The artificial recharge will enhance the sustainable yield wherever aquifers have depleted due to over exploitation. To conserve the rain water wherever it is received. To conserve and store excess run off water going waste for meeting out future requirement. To improve the quality of groundwater. To keep soil moisture content intact so that topsoil vegetation is protected.

The project area falls in Raipur district which is one of the centrally located District of Chhattisgarh state. The district extends between 19° 46'00" to 21° 49' 54" North latitudes and 81° 25' 24" to 83° 15' 58" East longitudes and is bounded on north by Bilaspur, Janjgir-Champa on the West by Durg on the East by Mahasamund and Dhamtari.

The Watershed is known as Hilly and Forested area of Fingeshwar occupies an area of about 200 Sq. km. It lies between 20° 50' 53" to 21° 5' 13" N and 81° 53' 0" to 82° 10' 30" E in Fingeshwar & Chhura block of Raipur district.

The total geographical area of the Hilly and Forested area of Fingeshwar water shed is about 213 Sq.km. situated in the Raipur district covering parts of Rajim block of the Raipur district. Out of the total area of the watershed about 29.15 % comes under hilly and forested area.

The Fingeshwar area enjoys a tropical climate with hot summer followed by well-distributed rainfall through South-West monsoon season. The winter commences from December and last till the end of February. The period from March to the end of May is hot season. The monsoon season starts from the middle of June and last till the end of September with an average annual rainfall of 975 mm.

Geomorphologically the area is occupied by Structural plain on proterozoic rocks, pediplain/pediment. These landforms are formed because the rocks were exposed to renewed post depositional activities and were subjected to intensive and extensive pedimentation, peneplanation and denudation during Pre-Quaternary and Quaternary time. Hilly and Forested area of Fingeshwar is the part of Mahanadi drainage system.

Geologically, the Fingeshwar area area is occupied by mainly granite of Dongarhgarh group, sandstone, limestone, shale of Chhatisgarh Supergroup belonging to Proterozoic age. These formations are overlain unconformably by Sub-recent to Recent Alluvium.

The chemical quality of the ground water in the watershed is suitable for domestic and irrigation purposes.

B) Recommendation:

There is a scope to construct of Nala bunds/ Check dams, Gabbion structures, Percolation tanks and Contour trenching/ Contour bunds in the hilly/forested area of the Fingeshwar Range. The tentative estimated cost to construct all these artificial recharge structures is approximately coming around 134.4 Lakhs. Ground water in ample Quantity can be recharged by constructing above structures.

TOTAL PROJECT AREA = 2400.00 Hect.

PROJECT COST: RS. 384.00 LACS

**Divisional Forest Officer
Forest Division Raipur**